

# Use of HAZUS-MH to Support Long-Term Community Recovery and Mitigation (ESF #14)



Under the National Response Plan (NRP), Emergency Support Function #14 (ESF # 14) provides a coordination mechanism for the Federal government to assess the consequences of disasters and to coordinate the long-term recovery. ESF #14 is typically activated for large scale disasters that require Federal assistance to address significant long-term impacts on the affected area (including impacts on housing, business and employment, and community infrastructure). ESF #14 addresses three dimensions of recovery:

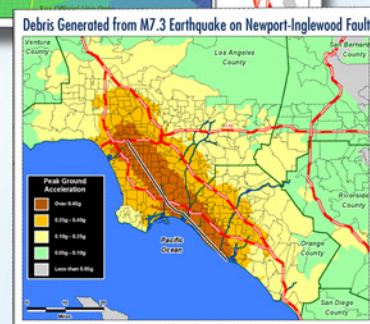
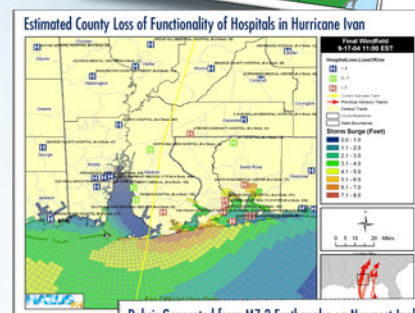
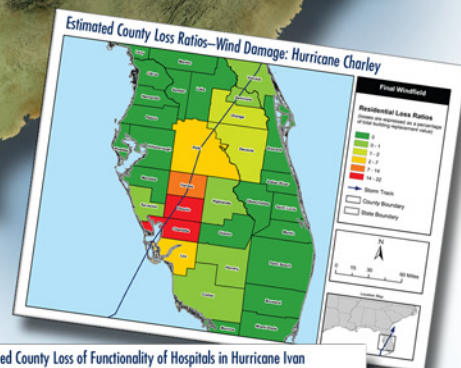
- Social and economic community impact assessment
- Long-term community recovery assistance to States, local governments, and the private sector
- Mitigation analysis and program implementation

HAZUS-MH has three core capabilities that can contribute to the implementation of ESF #14. HAZUS-MH can:

- **Measure** potential effects of consequences of a disaster.
- **Simulate** benefits and losses potentially avoided through the implementation of mitigation measures.
- **Assess** County Loss Ratios, which measures residential loss as a percentage of total residential building value.

## Use of HAZUS to Estimate Losses Avoided Through Mitigation

HAZUS-MH can be a valuable tool in estimating damage and loss of functionality from floods, earthquakes, and hurricanes and the benefits from the implementation of select mitigation measures. The product of this analysis is estimates of losses avoided. Table 1 provides examples of losses avoided that can be estimated with HAZUS-MH from the implementation of various mitigation measures.



## Losses Avoided from Select Mitigation Measures

Damage/Loss Categories	Losses Avoided
<b>Physical Damage</b> <ul style="list-style-type: none"> <li>■ Buildings</li> <li>■ Contents</li> <li>■ Infrastructure</li> <li>■ Landscaping</li> <li>■ Site contamination</li> </ul>	Avoided physical damages
<b>Loss of Function / Economic Impacts</b> <ul style="list-style-type: none"> <li>■ Loss of business income</li> <li>■ Loss of Rental income</li> <li>■ Lost wages</li> <li>■ Shelter costs</li> <li>■ Disruption time for residents</li> <li>■ Loss of public services</li> <li>■ Economic impacts associated with loss of transportation and utility functions</li> </ul>	Avoided costs associated with loss of function
<b>Casualties</b> <ul style="list-style-type: none"> <li>■ Deaths</li> <li>■ Injuries</li> <li>■ Illnesses</li> </ul>	Avoided casualties
<b>Emergency Management Costs</b> <ul style="list-style-type: none"> <li>■ Emergency Operations Center costs</li> <li>■ Evacuation / Rescue costs</li> <li>■ Debris removal and cleanup costs</li> <li>■ Temporary measures costs</li> </ul>	Avoided costs associated with emergency services and cleanup

Table 1. Losses Avoided from Select Mitigation Measures

## Hurricane Model Applications for ESF #14

The HAZUS-MH hurricane model is particularly well suited to estimating losses avoided through the implementation of mitigation measures. The hurricane model incorporates the following mitigation options for Single Family Residential:

- Roof covering
- Secondary water resistance
- Roof sheathing attachment
- Roof framing attachment
- Opening protection

For Manufactured Homes, the hurricane model includes two mitigation options:

- Tie-Downs
- Shutters on all windows and entry doors

In 2003, FEMA sponsored a study to quantify the benefits of implementing select hurricane wind mitigation measures in South Florida. The results are shown on Table 2.

Benefits from Wind Mitigation Measures in South Florida	
Single Family Homes	Reduction in Annualized Hurricane Losses
■ Install Shutters.....	17% to 46%
■ Upgrade Roof .....	3% to 49%
■ Add Secondary Water .....	3% to 35%
Resistance (SWR)	
■ Upgrade Roof & Add SWR.....	4% to 57%
■ Install Shutters & Upgrade Roof.....	46% to 71%
■ Install Shutters, Upgrade Roof and SWR.....	51% to 85%
Manufactured Homes	
■ Foundation Tie Down .....	9% to 25%

Table 2. Benefits from Wind Mitigation Measures in South Florida

### Application of Losses Avoided Analysis in SW Florida

In 2005, FEMA and the Florida Division of Emergency Management sponsored the SW Florida HAZUS-MH Pilot Project. One of the objectives of the project was to identify and implement a series of projects and activities that demonstrate the capabilities of HAZUS-MH to support mitigation and disaster response.

The Mitigation Working Group used HAZUS-MH to prepare an analysis of losses avoided from hurricane wind damage—expressed as savings in annualized losses—from the implementation of mitigation projects. The study findings are highlighted in Figure 1.

< [View larger graphic.](#) >

Residential Buildings and  
Contents—  
Structural Protection

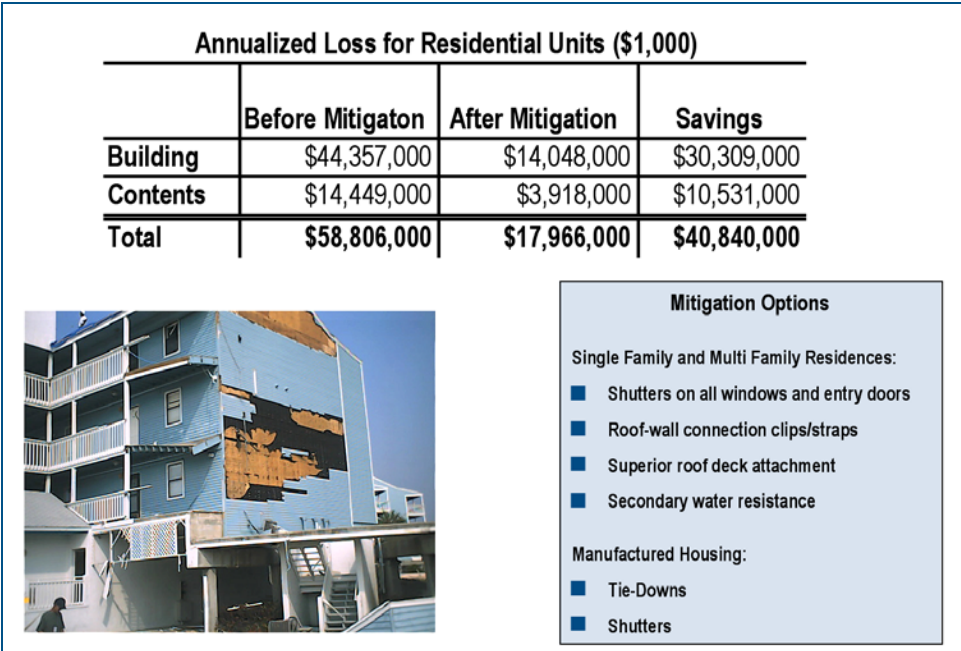


Figure 1. Annualized Savings from Adoption of Mitigation Measures

## County Loss Ratios

A third use of HAZUS-MH for ESF #14 is analysis of County Loss Ratios.

During the 2004 and 2005 hurricane seasons, FEMA used HAZUS-MH to assess County Loss Ratios in Florida, Alabama and Mississippi. County Residential Loss Ratios measure residential loss as a percentage of total residential building value. A loss ratio greater than 5% signifies that a community has suffered extensive residential damage, when the damage is measured as a percentage of the total residential building value. This information helps in planning and prioritizing the long-term recovery activities. HAZUS-based benefit-analyses can then be used in support of decisions on identification of mitigation alternatives and priorities for the most seriously affected communities.

Figure 2 shows the results of the HAZUS-MH analysis of County Loss Ratios following Hurricane Charley in 2004. The analysis shows that Charlotte and Desoto counties have loss ratios that exceed 14%, which indicates severe residential damage, and should be targeted for Individual Assistance programs.

< [View larger graphic.](#) >

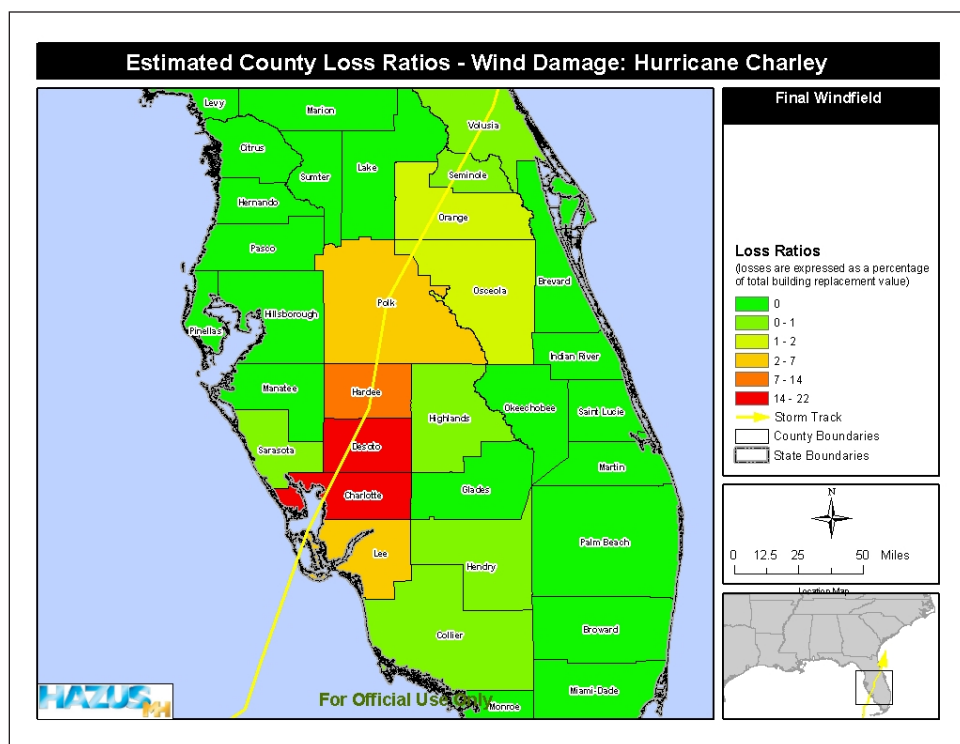


Figure 2. Estimated County Loss Ratios – Wind Damage: Hurricane Charley (2004)

In summary, ESF#14 provides the coordination mechanisms for the Federal government to assess the consequences of the disaster in the impacted areas and to coordinate the long-term recovery. In this context, HAZUS-MH can be used to support post-disaster analysis, including assessments of:

- Social and economic impacts;
- Losses avoided from the implementation of mitigation measures;
- Severity of residential damage, expressed as County Loss Ratios.



**FEMA**

For more information, visit:  
[www.fema.gov/plan/prevent/hazus](http://www.fema.gov/plan/prevent/hazus)



## Annualized Loss for Residential Units (\$1,000)

	Before Mitigation	After Mitigation	Savings
<b>Building</b>	\$44,357,000	\$14,048,000	\$30,309,000
<b>Contents</b>	\$14,449,000	\$3,918,000	\$10,531,000
<b>Total</b>	<b>\$58,806,000</b>	<b>\$17,966,000</b>	<b>\$40,840,000</b>



### Mitigation Options

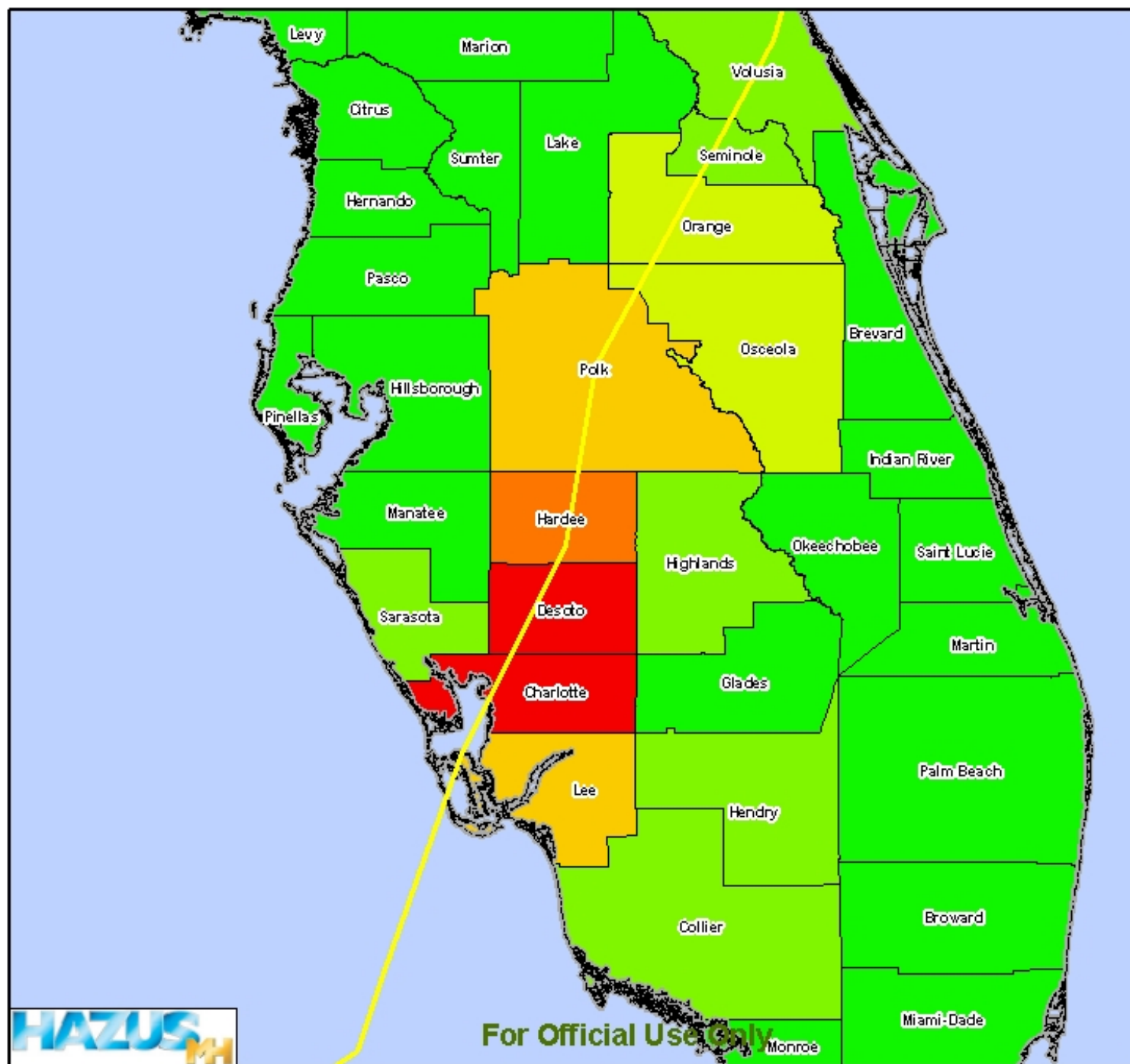
#### Single Family and Multi Family Residences:

- Shutters on all windows and entry doors
- Roof-wall connection clips/straps
- Superior roof deck attachment
- Secondary water resistance

#### Manufactured Housing:

- Tie-Downs
- Shutters

# Estimated County Loss Ratios - Wind Damage: Hurricane Charley



## Final Windfield

### Loss Ratios

(losses are expressed as a percentage of total building replacement value)

- 0
- 0 - 1
- 1 - 2
- 2 - 7
- 7 - 14
- 14 - 22

Storm Track

County Boundaries

State Boundaries



0 12.5 25 50 Miles

Location Map

